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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to a suitable audio output device to control from a loudspeaker the sound volume which carries out sound emission using an integrated circuit.

[0002]

[Description of the Prior Art] Although the microcomputer for carrying out sound emission of the scales (a melody, buzzer, etc.) is sold from current and a loudspeaker, this microcomputer is constituted as follows. That is, sound emission actuation is realized by making the scale source of release which can generate the signalling frequency corresponding to two or more scales build in, minding ejection for the signalling frequency of the predetermined scale chosen as the interior of a microcomputer according to the program from an output terminal, minding external resistance for this signalling frequency, and giving a loudspeaker. By the way, when the so-called volume control of being as making it small \*\*\*\* [, and ] is performed, [ enlarging sound volume of a loudspeaker further from the present magnitude ] Between the output terminal of the microcomputer with which signalling frequency is outputted, and the terminal of the loudspeaker which gives said signalling frequency The series connection of two or more resistance was carried out, and it prepared as a load, and the load of a loudspeaker was made adjustable by short-circuiting the predetermined resistance in resistance of these plurality, and audio volume control by which sound emission is carried out from a loudspeaker from this is realized. As the concrete approach, the machine switch or the switching transistor was respectively prepared in each of two or more resistance by which external connection was made, it is performing closing motion of a machine switch, or turning on and off of a switching transistor by actuation of a user, and the serial number of resistance was changed to the microcomputer and it was coped with.

[0003]

[Problem(s) to be Solved by the Invention] However, there are dramatically many external components of a microcomputer and the problem of a cost rise arises. Furthermore, in order that a user might perform signal generation for actuation of the machine switch of each [ one's volition ], or the on-off control of a switching transistor, there was also a problem from which actuation becomes complicated.

[0004] Then, as for this invention, volume control of a loudspeaker aims [ the number of external components ] few at offering an easy audio output device.

[0005]

[Means for Solving the Problem] The place by which accomplishes this invention in order to solve said trouble, and it is characterized [ the ] The scale source of release which can generate selectively the signalling frequency corresponding to two or more scales, The scale setting-out circuit to which the signalling frequency corresponding to one kind of predetermined scale which directs one kind of scale and is set up in said scale source of release is made to output from said scale source of release, The switching transistor switched by the signalling frequency outputted from said scale source of release, Two or more resistance groups by which the series connection was carried out to said switching transistor, and two or more short circuits which parallel connection is carried out to each of two or more

of said resistance groups, and short-circuit each of said resistance group selectively, The holding circuit holding the control signal for connecting or intercepting said two or more short circuits selectively, Prepare in the interior of a microcomputer and the end of the side which is not connected with said switching transistor of two or more of said resistance groups is connected with the loudspeaker of said microcomputer exterior. It is the point of adjusting the sound volume by which sound emission is carried out from said loudspeaker, by making said control signal acquired by decoding a program with said microcomputer hold to said holding circuit, and controlling connection and cutoff of said short circuit.

[0006]

[Function] According to this invention, the serial number of a resistance group was controlled by establishing two or more short circuits for short-circuiting selectively each of two or more resistance groups for adjusting the sound volume of a loudspeaker, and these resistance groups in the interior of a microcomputer, and making the control signal acquired by the decode result of program data hold to a holding circuit. The external components of a microcomputer are reduced, a cost cut can be aimed at, and it becomes still easier from this for a user to operate it.

[0007]

[Example] The detail of this invention is concretely explained according to a drawing. Drawing 1 is drawing showing the audio output device of this invention. In drawing 1, - (1-1) (1-n) is a scale source of release, two or more T flip-flops (not shown) by which the series connection was carried out are prepared in the interior, and carries out dividing of the reference clock RCK, and has the structure where signalling frequency can be generated from the T flip-flop of a predetermined number-of-stages eye.

That is, - (1-n) can generate selectively the signalling frequency equivalent to 12 sounds from each scale source of release (1-1) and DO to Si. (2-1) - (2-n) is a scale setting-out circuit, and outputs the setpoint signal for setting up which scale in a scale source of release (1-1) and 12 sounds respectively - (1-n).

That is, the setpoint signal impressed to scale source-of-release (1-1) - (1-n) from scale setting-out circuit (2-1) - (2-n) is a signal which controls whether the how many steps of T flip-flop of two or more T flip-flops built in a scale source of release (1-1) - (1-n) the interior to signalling frequency is generated. Specifically inside each [ a scale source of release (1-1) - (1-n) ], the signalling frequency corresponding to the scale which he wishes from the T flip-flop of the last stage can be acquired by preparing the two or more bits presetting register for setting respectively two or more T flip-flops by which the series connection is carried out according to a scale, setting the T flip-flop of arbitration, and carrying out dividing of the reference clock RCK. In response to directions of the scale which should output said especially presetting register, presetting of the presetting data according to this scale is carried out each time, and presetting data have the composition of being impressed by the T flip-flop from the presetting register by the trigger signal created based on the output with which it was obtained from the T flip-flop of the last stage. (3-1) - (3-n) is the AND gate, one input terminal is respectively connected with the output of the last stage of a scale source-of-release (1-1) - (1-n) output T flip-flop, and the selection signal which directs the AND gate (3-1) - (3-n) which are opened respectively is impressed to the input terminal of another side. Here, the selection signal which controls the setpoint signal outputted from scale setting-out circuit (2-1) - (2-n) and the AND gate (3-1) - (3-n) closing motion shall be determined as a predetermined condition based on the result of having decoded the program by which reading appearance was carried out, from ROM which operates a microcomputer. Moreover, - (4-1) (4-n) is N channel mold MOS transistor, each gate is connected with the AND gate (3-1) - (3-n) an output terminal, and the source is grounded. Moreover, - (5-1) (5-4) is the resistance by which the series connection was carried out, the end is connected with the drain of N channel mold MOS transistor (4-1), and the other end is connected with the output terminal (6). (7-1) - (7-4) is a transmission gate (short circuit), and parallel connection of each transmission gate (7-1) - (7-4) is respectively carried out to resistance (5-1) - (5-4). (8) is a latch circuit group (holding circuit), and it consists of four latch circuit (9-1) - (9-4). Latch circuit (9-1) - (9-4) L (latch) terminal is respectively connected with a 4-bit data bus, common connection of the C (clock) terminal is made with the output terminal of the AND gate (10), and Q (output) terminal is respectively connected with the transmission gate (7-1) - (7-4) control terminal. Although the same configuration is prepared also to N channel mold

MOS transistor (4-2) (4-3), since connection relation is the same, the explanation shall be omitted. In addition, the above configuration shall be prepared in the interior of a microcomputer.

[0008] Moreover, as an external configuration of a microcomputer, the series connection of diode (15) and the coil (16) is carried out between a power source V and an output terminal (6), and the loudspeaker (17) is connected to the coil (16) at the condition in which sound emission is possible. Drawing 2 is drawing showing the configuration which creates the latch data (control signal) for a latch circuit group (8), (13), and (14) inside a microcomputer. In drawing 2, (18) is ROM and the program data for controlling a microcomputer are memorized. (19) is instruction DEKOTA and decodes the program data by which reading appearance was carried out from ROM (18). Writing or reading appearance of the various data which (20) is RAM and were calculated inside the microcomputer is carried out. (21) is ALU which performs logical operation, performs data processing for making the control signal which incorporates the data by which reading appearance was carried out from RAM (20) through a data bus (22) based on the output A of an instruction decoder (19), and turns on any [ a transmission gate (5-1) - (5-4) ] they are, and makes the result write in RAM (20) again through a data bus (22).

[0009] Hereafter, actuation of drawing 1 and drawing 2 is explained. First, the case where sound emission is carried out from a loudspeaker (17) only with the signalling frequency of a scale source of release (1-1) is considered. In this case, the signalling frequency chosen with the output of a scale setting-out circuit (2-1) is outputted through the AND gate (3-1); and it becomes settled in the resistance (5-1) of - (5-4) from which the sound volume of a loudspeaker (17) serves as that load here and the serial number which have switched N channel mold MOS transistor (4-1). That is, a load becomes large, sound volume falls, so that there is many resistance, a load becomes small and sound volume goes up, so that there is few resistance. Then, if predetermined sound volume is obtained and a user operates the key for volume control (not shown) utterly, the interrupt signal which directs sound-volume modification (size or smallness) to actuation and coincidence of this key-will occur. With this interrupt signal, ROM (18) is jumped to this interruption address from the address which is performing current read-out, and the program data memorized by this interruption address are read. An instruction decoder (19) generates the decode signal A, as a result of decoding the program data by which reading appearance was carried out from ROM at this time (18). the control data changed by RAM's (20)'s carrying out reading appearance of this control data based on the decode signal A from the address with which the 4-bit control data which makes current transmission gate (5-1) - (5-4) the predetermined switching condition was memorized, and performing data processing for changing sound volume inside ALU (21) -- again -- RAM (20) -- said -- reading appearance is carried out and it writes in an address. Furthermore, reading appearance of the control data after modification is carried out from RAM (20), and it is supplied to a latch circuit group (8), (13), and (14). The decode signal C which directs further the decode signal B which, on the other hand, directs any other than said decode signal A shall be opened between the AND gate (10), (11), and (12) from an instruction decoder (19), and (14) a clock signal is given in a timing generating circuit (23) occurs. [ which latch circuit group (8), (13), and ] In this example actuation, only the input of the AND gate (10) will become high-level, 4-bit new control data will be latched to a latch circuit group (8), and a transmission gate (5-1) - (5-4) a switching condition will be changed, consequently resistance (5-1) of - (5-4) and a serial number will be changed, and the sound volume of a loudspeaker (17) will be changed.

[0010] In addition, although the above-mentioned explanation was an example which uses only the signalling frequency of a single scale source of release, it switches simultaneously two or more N channel mold MOS transistors which correspond using the signalling frequency with which two or more scale sources of release differ, and can carry out sound emission of the chord from a loudspeaker (17). In this case, what is necessary is just to make the predetermined plurality of the AND gate (3-1) - (3-n) inside into an open condition. Moreover, rewriting actuation of the above-mentioned RAM (20) is repeated to the latch circuit group which needs rewriting of control data, and it can realize by making a latch circuit group carry out a sequential latch.

[0011] In this example, although the number of resistance by which a series connection is carried out

between the drain of N channel mold MOS transistor and an output terminal was made into four pieces, it is not limited to this. As mentioned above, the external components of a microcomputer can be reduced, consequently a cost cut becomes possible. Moreover, actuation of a user also becomes easy.  
[0012]

[Effect of the Invention] According to this invention, the serial number of a resistance group was controlled by establishing two or more short circuits for short-circuiting selectively each of two or more resistance groups for adjusting the sound volume of a loudspeaker, and these resistance groups in the interior of a microcomputer, and making the control signal acquired by the decode result of program data hold to a holding circuit. From this, the external components of a microcomputer are reduced, a cost cut can be aimed at, and the advantage it becomes still easier for a user to operate is acquired.

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CLAIMS

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[Claim(s)]

[Claim 1] The scale source of release which can generate selectively the signalling frequency corresponding to two or more scales, The scale setting-out circuit to which the signalling frequency corresponding to one kind of predetermined scale which directs one kind of scale and is set up in said scale source of release is made to output from said scale source of release, The switching transistor switched by the signalling frequency outputted from said scale source of release, Two or more resistance groups by which the series connection was carried out to said switching transistor, and two or more short circuits which parallel connection is carried out to each of two or more of said resistance groups, and short-circuit each of said resistance group selectively, The holding circuit holding the control signal for connecting or intercepting said two or more short circuits selectively, Prepare in the interior of a microcomputer and the end of the side which is not connected with said switching transistor of two or more of said resistance groups is connected with the loudspeaker of said microcomputer exterior. The audio output device characterized by adjusting the sound volume by which sound emission is carried out from said loudspeaker by making said control signal acquired by decoding a program with said microcomputer hold to said holding circuit, and controlling connection and cutoff of said short circuit.

[Claim 2] The program for generating said control signal is an audio output device given in a claim shell characterized by carrying out reading appearance by the interrupt signal which adjusts the sound volume from said loudspeaker from the program memory prepared in said interior of a microcomputer or exterior.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the audio output device of this invention.

[Drawing 2] It is drawing for realizing volume control of this invention.

[Description of Notations]

(1-1) - (1-n) Scale source of release

(2-1) - (2-n) Scale setting-out circuit

(4-1) - (4-n) N channel mold MOS transistor

(5-1) - (5-4) Resistance

(6) Output terminal

(7-1) - (7-4) Transmission gate

(8) ((13) 14) Latch circuit group

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